63d Congress, 3d Session. | HOUSE OF REPRESENTATIVES. | Document No. 1476.

6

# PROTECTION OF LANDS AND PROPERTY IN THE IMPERIAL VALLEY, CAL.

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## LETTER

FROM

## THE ACTING SECRETARY OF THE TREASURY,

TRANSMITTING

**COPY OF A COMMUNICATION OF THE SECRETARY OF THE INTERIOR, SUBMITTING COPY OF A REPORT UPON A PROPOSED PLAN FOR THE PROTECTION OF LANDS AND PROPERTY IN THE IMPERIAL VALLEY, CAL., AGAINST OVERFLOWS OF THE COLORADO RIVER.**

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January 7, 1915.—Referred to the Committee on Appropriations and ordered to be printed, with illustration.

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ALSO

**COPY OF A COMMUNICATION FROM THE SECRETARY OF THE INTERIOR SUBMITTING ADDITIONAL MATTER AND SPECIFICATIONS IN CONNECTION WITH HIS ESTIMATE OF APPROPRIATION IN THE SUM OF $250,000 FOR THE PROTECTION OF LANDS AND PROPERTY IN THE IMPERIAL VALLEY, CAL.**

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January 11, 1915.—Referred to the Committee on Appropriations and ordered to be printed.

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Treasury Department,
Office of the Secretary,
*Washington, January 5, 1915.*

The Speaker of the House of Representatives.

Sir: I have the honor to transmit herewith, for the consideration of Congress, copy of a communication of the Secretary of the Interior, of this date, submitting copy of a report made by Gen. William L. Marshall, consulting engineer, to the Secretary of the Interior, upon a proposed plan for the protection of the lands and property in the

★

Imperial Valley, Cal., against overflows of the Colorado River, together with an estimate of appropriation in the sum of $250,000 for the necessary work of protection thereunder.

Respectfully,

BYRON R. NEWTON,
*Acting Secretary.*

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SECRETARY'S OFFICE,
DEPARTMENT OF THE INTERIOR,
*Washington, D. C., January 5, 1915.*

SIR: Herewith is a copy of a report made by Gen. William L. Marshall, consulting engineer to the Secretary of the Interior, upon a proposed plan for the protection of the lands and property in the Imperial Valley, Cal., against overflows of the Colorado River, together with an estimate in the sum of $250,000 for the necessary work of protection, which I have to request that you will forward to Congress.

I beg to urge the consideration by Congress of the advisability of an appropriation for this work; it is a matter of emergency and is of vital moment to Imperial Valley. The physical situation is presented by maps, which reveal the fact that without levee protection the Colorado River at a point below the United States boundary will at high water seek the lower levels within the United States. Gen. Marshall is familiar with this situation, having been engaged during the past year, under the direction of this department, in protective work at that point. He has a well-defined plan as to what may be done and an estimate is made as to its cost.

The interest of the United States in this matter lies in these, among other considerations:

1. The protection of some $30,000,000 or $40,000,000 worth of property in the Imperial Valley.
2. The protection of the Yuma irrigation project on the east side of the Colorado River.
3. The preservation of the navigability of the Colorado River, which is classed, I believe, as a navigable river as far north as Yuma.

This is a matter in which the Government of Mexico is also concerned, and I am informed that several years since negotiations were entered into with that Government respecting the protection of the lands along the Colorado against floods, but that these negotiations have not gone through owing to the recent disturbances in Mexico.

Inasmuch as the Colorado River reaches its maximum flow during the flood period of June, it is regarded by Gen. Marshall and others familiar with the situation that if protection is to be given it must be forthcoming at an early date. It was only by the expenditure of a considerable amount raised by the farmers and approximately $50,000 found to be available in the Treasury of the United States that the valley was kept from being flooded in June of last year.

Should Congress see fit to make an appropriation for this work, which I earnestly hope will be the case, I suggest the advisability of giving consideration to a plan by which a cooperative fund, to be expended by the United States, shall be made up of contributions from the United States Treasury and from the Imperial Valley irrigation district. It appeals to me as fair that the full burden in this case should not rest upon the Federal Treasury. The United States still owns a considerable body of land within this valley, the sale of which, if made at public auction in small tracts, would, I feel convinced, go far to fully reimburse the Federal Treasury for its expenditure, and this may be provided for in the act making such appropriation.

Respectfully, yours,

FRANKLIN K. LANE.

The SECRETARY OF THE TREASURY.

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*Estimates of appropriations required for the service of the fiscal year ending June 30, 1916, by the Department of the Interior.*

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|---|---|
| Protection of lands and property in Imperial Valley, Cal.— For protecting lands and property in the Imperial Valley and elsewhere along the Colorado River, within the limits of the United States, against injury or destruction by reason of the changes in the channels of the Colorado River, and the Secretary of the Interior is authorized to expend any portion of such money within the limits of the Republic of Mexico as he may deem proper in accordance with such agreements for the purpose as may be made with the Republic of Mexico (submitted) | $250, 000. 00 |

# REPORT

ON THE

# PROTECTION OF LANDS AND PROPERTY IN THE IMPERIAL VALLEY, CALIFORNIA

AGAINST

# OVERFLOWS OF THE COLORADO RIVER IN MEXICAN TERRITORY.

By Gen. Wm. L. Marshall.

(Made by direction of Hon. Franklin K. Lane, Secretary of the Interior.)

Department of the Interior,
United States Reclamation Service,
*Washington, D. C., January 2, 1915.*

Subject: Control of the Colorado River below Pilot Knob.

The Secretary of the Interior.

Sir: (1) In accordance with your directions I have prepared the following memorandum or report upon the present conditions existing in the Colorado River delta in so far as menaces to lands and property in Imperial Valley are concerned by overflows of the Colorado River at flood stages and as to what work is now necessary in my opinion to prevent damage during the approaching flood season.

(2) The physical and related facts concerning the Colorado River and its delta have been repeatedly published in congressional documents, notably in House Document No. 504, Sixty-second Congress, second session, February 2, 1912, and in Senate Document No. 846, Sixty-second Congress, second session, both being messages from the President of the United States containing plans and estimates of works required for the protection of lands and property in the United States from overflows of the Colorado in Mexican territory and thence into the United States.

(3) It is unnecessary here to repeat what is contained in the documents cited, but I attach hereto a separate memorandum giving my views of the problem.

(4) Since the message of the President dated June 12, 1912, contained in the document last referred to, there has been no change in the international situation. There has not been effected any arrangement with Mexico whereunder the United States may enter Mexican territory, or do work therein for protecting its lands against overflows from Mexican territory, or providing that Mexico will do the necessary work or allow it to be done under United States authority.

(5) The physical situation has become more and more threatening, and in April, 1914, the river caved its banks so far as to carry away some 1,500 linear feet of levee at mile 7, measured below the intake of the Imperial Canal, which crevasse was closed under your direction in May, 1914, by leveeing around it, and for 2 miles above this break the river has caved up to the base of the levee, where caving was stopped by work of revetment under your direction, and by local authorities. The revetment is incomplete and can not hold the levee against further attack. For 4 miles above this stretch of 2 miles the river is very near the levee, and the situation is threatening and the danger imminent on any flood.

(6) The further caving along this stretch of about 7 or 8 miles immediately below the intake of the Imperial canal would be followed by an overflow directly into the Imperial canal or into the Paradones, thence into the Alamo River (Imperial canal), with possibly disastrous results to Imperial Valley. If, however, the levee and banks be held by revetment throughout the 7 or 8 miles referred to, the water flowing down the Abejas and over the natural banks of the Colorado can reach American territory only by a breach in the Volcano Lake Levee, or by the general overflow extending south of the levee and through a gap of about 8 miles or less between the westerly end of this levee, which is near the Abejas Channel and the end of Volcano Lake Levee, which terminates at the Paradones River and Arroyo Saiz.

(7) There is no reason now apparent for departing from the policy indicated by the President in the message of June 14, 1912:

> In my message (Feb. 2, 1912) I stated that I did not at that time make a definite recommendation, for the reason that the plan to be adopted for the betterment of conditions near the mouth of the Colorado River proves to be so dependent on a free and full agreement between the Government of Mexico and the Government of the United States as to joint expenditure and joint use that it is unwise to move until we can obtain some agreement with that Government which will enable us to submit to Congress a larger plan, better adapted to the exigencies presented than the one adopted. * * *

(8) The work then proposed was that laid out by a special board in 1911, as follows:

> We recommend that further work should be undertaken at once and in approximately the following order:
>
> (*a*) The levees north of Volcano Lake should be raised, strengthened, and extended.
>
> (*b*) The existing levees along the west bank of the Abejas should be repaired and protected.
>
> For this purpose and to meet emergencies there should be immediately available the sum of at least $1,000,000.
>
> This provides only for temporary maintenance of levees and does not include the systematic revetment of banks.

(9) But the estimate submitted by the President in this message of June 14, 1912, contained an estimate that at least $1,250,000 should be at the disposal of the President, $500,000 for levees, and $750,000 for revetting the banks to prevent caving on both the Mexican and American sides.

(10) This work is still necessary to be done, and as the river is now against the levee or near its toe for 2 miles, and threatens its destruction for 5 miles, and inasmuch as flood water actually passed around the end of the Volcano Lake levee at Bayou Saiz and breached this levee near its eastern end in June, 1914, it is very apparent that only prompt and energetic work can save the Imperial Valley against

overflow if there be any flood in the Colorado in 1915. The overflow has already blocked out a path for the river, and plainly indicated the field of attack.

(11) There is a difference of opinion among engineers as to the method that should be adopted for the ultimate control of the Colorado River, some engineers insisting that it should be put back into the easterly one of its delta channels, which occupies the highest ridge in the delta—a line of unstable equilibrium which the stream continually seeks to abandon—and others who think the stream should occupy the lowest possible line, or a line of stable equilibrium that it can not leave until after years or ages of sedimentation and deposit when it may lift itself sufficiently high to flow elsewhere.

(12) It is useless to discuss this matter now or until some arrangement is made with Mexico under which we may have some right to concern ourselves with that particular problem. Meanwhile it is necessary to protect our own territory in the most direct, certain, and speedy way, and it is believed that there is very little disagreement about what means are required to that end; there is disagreement, however, as to the length of time the work will be effective. It is fortunate, perhaps, that the most direct and economical defenses for our lands will also protect all irrigated lands under the Imperial Canal in Mexico.

(13) It is believed to be conceded that whatever may be the ultimate treatment of the Colorado River, or in whatever manner water for irrigation of lands in Imperial Valley may be carried from the Colorado River to the lands, flood water should not be allowed to flow into the Salton Sink over Volcano Lake and New River. This requires that the Alamo drainage area and the Salton Sink should be forever divorced or separated from the Colorado delta proper; this requires a levee between the Imperial canal and the Paradones River from the intake of the Imperial canal to Black Butte west of New River and north of Volcano Lake; and that the river front be revetted with stone throughout a distance sufficient to compel the overflow from floods of the Colorado to pass south of the line of the present Colorado Development Co.'s levee to prevent congestion and caving along the old channels of the Paradones River and Arroya Saiz, as occurred at periods before the construction of the Colorado Development Co.'s levee.

(14) This latter requirement demands a revetment of the river banks from the intake of the Imperial canal around the head of the Paradones drainage area, or for 7 or 8 miles; it would be better to carry such revetment to the United States-Sonora line, or to the Abejas break, but it is not now essential or even necessary.

(15) This work was estimated, in the President's message of June 14, 1912, to require an appropriation of $1,250,000.

(16) The estimate was made under the supposition that American labor and animals would be used to do the work and that all necessary materials would be admitted into Mexico free of duty.

(17) In May and June, 1914, duties of from 40 to 1,000 per cent, averaging 60 per cent, were exacted; American labor and American animals were practically excluded, and only very inefficient Mexican labor and foremen, and Mexican mules and horses were allowed.

(18) It is impossible to estimate cost of work under such conditions, superadded to annoyances due to the anarchistic rule now prevalent

in Mexico. The levee work in 1914 cost 47 cents per cubic yard, and the stone for revetment cost $1.25 and $1 per cubic yard, dumped approximately in place for revetment. These prices are more than double what similar work can be done for in the United States in that immediate vicinity. There is also an element of danger that would deter American labor, even if allowed, and the duties and annoyances at the boundary line would keep out mules and stock. The export tax on mules was $40 per head last summer, to be paid when animals are withdrawn from Mexico—whatever the duties are now is unknown to me. The duties are whatever the local chieftain may impose.

(19) The Southern Pacific Railroad Co. is the only organization having an adequate equipment for doing the revetment work. The treatment that company has received in response to its efforts to aid has not conduced to much enthusiasm on its part to aid the work or to heed further appeals under any conditions.

(20) All the work on the levee and revetment (estimated at $1,250,000) is not necessary for protection against the 1915 flood; but it is considered necessary that at least 3 miles out of 8 of the revetment shall be done now, at once, and that the Volcano Lake Levee shall be provided with a banquette at least 4 feet high and 30 feet wide against its rear (Salton) side for 7 miles of its length, beginning at Black Butte, and that the levee be extended and raised to an average height of 7 feet above the surface to and past Beltran Slough and on the north side of the Paradones to cover the gap between the present Volcano Lake Levee and the Colorado Development Levee, to be ultimately extended to the intake of the Imperial Canal; the levee to have a crown of 8 feet, side slopes of 3 horizontal to 1 vertical, a muck ditch of adequate section, as found necessary upon actual construction, and to be protected on the south side by a gravel or stone blanket.

(21) The work considered necessary to be done before the high water of 1915 is estimated at—

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|---|---|
| Banquette Volcano Lake Levee, 210,000 cubic yards, at 30 cents | $63,000 |
| Extension Volcano Lake Levee, 400,000 cubic yards, at 25 cents | 100,000 |
| Revetment, 3 miles, at $40,000 | 120,000 |
| 100,000 square yards riprap, at $1 | 100,000 |
| Aggregate | 383,000 |
| Engineering and contingencies, 15 per cent | 48,450 |
| Total | 431,450 |

This is about one-fourth the work contemplated by President Taft in 1912.

The estimate is not based upon survey and is approximate only. It would be ample if it were done in the territory of the United States with American labor.

(22) This does not contemplate raising Volcano Lake Levee where it is on level ground or for 5 miles eastward from Black Butte, but contemplates a bank or banquette reinforcement 30 feet wide, 4 feet high in rear of the existing levee, an extension of this levee 8 miles, and a raising of the existing easterly 3 miles—both to be at crown about 7 feet above the natural sloping surface of the site of the levee. The Volcano Lake Levee also to be materially strengthened where it

connects with Black Butte and wherever it crosses New River and old sloughs.

(23) If the Colorado Development Co.'s levee is not breached, this work if done in time will prevent overflow for several years.

(24) If the Inter-California Railroad could be induced to place its tracks upon an embankment 6 feet high from the headworks of the canal to the Station Bataques and allow the levee north of Volcano Lake to join on to this roadbed embankment at that point, it would complete the levee recommended and add materially to the safety of its roadbed. The irrigated lands could well afford to pay all or part of the cost of such work.

(25) With reference to the raising of the Volcano Lake levee, I have to say that in 1911 the water stood about 6 inches lower than in 1914. In 1914 the levee was 4 feet 6 inches above extreme flood height. It is not probable that the flood level of Volcano Lake will rise to the top of the levee for several years. The danger is that the levee will be flanked by the general overflow of the delta through the open area between the ends of the Volcano Lake and the Colorado Development Co.'s levee and breached by flow in rear against the levee by this overflow water.

The sediment carried by the Colorado River has been estimated as enough to cover 53 square miles 1 foot deep annually. The area of the Volcano Lake flat, including the lake itself, is more than twice the above, and if all sediment carried were deposited on this flat it would take nine years to fill the area to the top of the Volcano Lake levee; but, as observed in 1912 and in 1914, the sediment is deposited in the general overflow area nearer the Abejas break, and the water reaching Volcano Lake and the Hardy Colorado has been observed to be but slightly muddy.

(26) There is very little known of the physical conditions existing in the Colorado River delta, and statements of what is taking place due to the new course of the Colorado can not be either proved or disproved by actual survey. Accurate topographic surveys should be made of the entire delta, and borings in the bed of the easterly outlet (old channel) to enable us to properly estimate the proper height of Volcano Lake Levee as a permanent protection and to form some opinion as to the resistance of the bed of the old channel to erosion in case it may in future be determined to divert Bee River into that channel, as demanded by many interests in Mexican lands.

Respectfully submitted.

W. L. Marshall,
*Consulting Engineer.*

# APPENDIX I.

## MEMORANDUM ON CONTROL OF COLORADO RIVER.

1. The Colorado River below Pilot Knob has always at stages above average high water emptied into the Gulf of California and Salton Sink through several channels, more or less well defined, and by a general overflow of its banks into these channels. It has never passed an unusual flood through a single channel. The banks, indeed, are built up by deposits from the average high-water flow of the stream.

2. In 1905–6 it left its easterly channel a short distance below the head of the delta and nearly all the discharge flowed via Alamo and New Rivers into Salton Sink, and into the Paradones and Volcano Lake and Hardy-Colorado River.

3. This break was finally closed in 1906 and a levee constructed forcing the river to discharge floods in part through its easterly channel and in part by overbank flow into the Abejas and Pescadero Rivers, Volcano Lake, and Hardy-Colorado River. The overbank flow compelled the construction of the Colorado Development Co. Levee and the original Volcano Lake Levee to exclude the general overflow from Imperial Valley from the southward and eastward.

4. The resultant increase in flood level caused, as just stated, a great overbank flow and rapid erosion and enlargement of the head of Abejas River, and in 1909 practically all the flow of the Colorado River at low and medium stages flowed through the Abejas River, Volcano Lake, and the Hardy-Colorado River into the Gulf of Mexico.

5. In 1910 Congress appropriated $1,000,000 for the protection of lands and property in Imperial Valley from the overflow of the Colorado, and an attempt was made to close the Abejas break and to construct a levee 25 miles long, with a view to put the river back into the easterly of its delta channels and keep it there. Whether from defective plan or defective workmanship the levee was destroyed and the dam was broken before the main river attained its mid stage or the levee itself subjected to much pressure.

6. Fortunately local authorities or the Southern Pacific Railroad Co. had constructed prior to 1910 an inadequate and not continuous levee north of Volcano Lake. For five years the lands and property in Imperial Valley have been safeguarded by this weak and inadequate levee. This levee was raised and enlarged in 1912 by the United States Government, using part of the appropriation of 1910. The levee now requires raising and extending.

7. Below the Abejas break the "old channel" or easterly outlet of the Colorado is now nearly obliterated by sand, growths of willows, arrow weed, etc. There is no channel there capable of carrying any considerable part of the flood discharge without overflow, nor can it in my opinion be made of adequate capacity to carry the maximum floods in a reasonable time and at endurable cost. This opinion, however, is not accepted by many engineers of ability, who insist that it may safely be done in one year.

8. To explain the basis of the writer's opinion it is necessary to indulge in technical language so far as to state some accepted rules or formulæ in hydraulics of streams, and the results of their application, under such assumptions as appear reasonable. There is very little known of physical details on the Colorado Delta. There can be no assumption of accuracy, but the approximation is sufficiently justified and conclusive.

(*a*) The silt-bearing capacity of a stream increases with the fifth power of the velocity. (This is the greatest value assigned to it; some authorities say third power of the velocity or less.) So long as the velocity of the current is not changed the river will carry no more sediment than at present, nor excavate any channel; and velocity requires slope or head; water will only flow under such influences.

(*b*) The velocity increases, other things being equal, directly with the square root of the slope, or, if the section changes, with the square root of the hydraulic radius (or mean depth) multiplied by the slope.

9. If we assume that at least double the present amount of silt must be carried at all stages in order to excavate an adequate channel for the river, then the velocity of its current must be increased by 15 per cent. So long as the velocity is not increased the current will carry no more silt than at present nor excavate any channel.

10. Since there must be excavated from 200,000,000 to 400,000,000 cubic yards, as variously estimated in the absence of surveys, to form a suitable channel from the Abejas to the Gulf, it would require from four to eight years of such double silt-bearing capacity if it can be obtained, to excavate the channel by the discharge itself, the Colorado carrying 54,000,000 cubic yards of silt annually. Much of the material in the old channel has been consolidated for centuries, and may not readily be moved.

11. The slope at high water from the Abejas break to the Gulf is about 80 feet. To obtain an increase of 15 per cent in velocity there must be an increase in slope of 32 per cent or increase in the product of mean depth and slope of that much, which requires a rise at the Abejas break in flood level of 80 feet × 0.32, or 26 feet, or 17 feet, the former if the mean depth be constant, and the latter if there be such change in mean depth and slope as to make an increased product equal 32 per cent, which flood level may be reduced to normal in a long course of years when the new channel is completely formed by erosion. If the channel is to be excavated in less time or at greater rate, the velocity must be still further increased, and the increase in flood height correspondingly greater.

12. A rise much less than 17 feet in flood level at the Abejas break will cause the destruction of every levee yet built in the vicinity of Yuma or the reconstruction of these levees at an enormous cost to meet the increase in flood level.

13. As bearing upon this subject of increase of slope and velocity, it may be well to state that from May 1 to June 17, 1914, the Colorado at Yuma rose a little more than 8 feet, and actual gauge readings showed that its slope increased more than 5 feet in less than 14 miles, or 0.35 foot per mile. It increased its slope by 38 per cent over its value at 20 feet on the Yuma gauge, or materially more than I have hypothetically given above for the probable increase in slope below the Abejas River, under most favorable assumptions.

14. The closing of Bayous Plaquemine and La Fourche, La., and the repair and completion of levees south of Red River since 1882 have resulted in an increase of flood height of the Mississippi River of over 5 feet since that date at New Orleans, and the slope of its water surface from New Orleans to the Gulf of Mexico has increased by 42 per cent. This extreme flood slope has been maintained for 20 years. Numerous other examples may readily be given in refutation of the theory that sedimentary rivers adjust their capacities to the discharge without change in slopes, i. e., that they increase their discharge, hydraulic radius, and velocity without any change whatever in slope. Such statements are always unaccompanied by slope observations, which would in nearly every case refute them. Sedimentary rivers are not exempt from laws of flowing waters in rivers and streams, as claimed by these theorists who will not take slope observations at all.

15. To force the river back into the so-called old channel will require not only high levees well protected against longitudinal scout and caving, but also a very elaborate and costly system of groins or spurs at frequent intervals extending from the levees to the banks of the proposed new channel, to force the river to follow the desired course. These groins or spurs must extend above extreme flood height throughout the leveed reach and be well protected by stone against caving and scour.

16. This is evident when we consider that the slope of the surface along the site of the levees proposed up to this time is about three times the slope of the old channel and there will be a channel better than the old channel immediately against the levee, included between the levee and the natural surface of the ground which rapidly falls away from the banks of the old channel.

17. The designs, plans, and specifications for levees up to this time proposed for closing the Abejas break and confining the river in its old channel are such that the levees would be destroyed at the first rise after completion, probably, and certainly at the first flood exceeding 100,000 cubic feet per second.

18. It would be interesting for purposes of education, however, for the United States to accept the offer of the Southern Pacific Railroad to put the river back into the old channel and maintain it there through one flood at the fixed price offered, providing that the "flood" shall exceed 90,000 cubic feet per second, but it should be accepted only on the "no cure no pay" basis.

19. Any attempt to put the Colorado River back into its old or easterly partial outlet and to concentrate its flow into that one channel by levees—and by closing the Abejas outlet—in one or two seasons will inevitably meet with failure; another break will at once occur above or below the Abejas and such attempts would, if repeated, continue to meet such results. If deemed advisable to confine the river to one channel, the work must be done very carefully, skilfully, and gradually, the levees well revetted, and the banks protected against caving. The levees should be built and protected for at least one year before closing the Abejas break.

20. Although it is almost inconceivable that the rich delta lands will not ultimately be protected by levees and reclaimed, there can be no security for lands in the Salton Sink, whatever course may be taken with regard to the channel of the Colorado, without divorcing

forever by suitable works the Alamo drainage area, including Imperial Valley, from the rest of the Colorado Delta, to prevent overflow from Mexico if front levees break, and this, fortunately, is easily effected by a sufficient embankment between the Alamo and Paradones River and north of Volcano Lake, extending from Black Butte west of New River to the intake of the Alamo Canal, and by revetting thoroughly the west bank of the Colorado from the intake for 7 miles downstream.

21. This solution is easy. The course of the Colorado in so far as it flows in the trough occupied by Volcano Lake and Hardy River is now in a stable line—the lowest possible line—and it should remain there, in so far as affects the interests of the United States and the security of the property within the limits of the United States. All the works proposed for the control of the Colorado under any project will be in Mexican territory.

Respectfully,

W. L. MARSHALL,
*Consulting Engineer.*

## LETTER FROM THE ACTING SECRETARY OF THE TREASURY, TRANSMITTING LETTER FROM THE SECRETARY OF THE INTERIOR, SUBMITTING ESTIMATE OF APPROPRIATION FOR PROTECTION OF LANDS AND PROPERTY IN THE IMPERIAL VALLEY, CALIFORNIA.

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Treasury Department,
Office of the Secretary,
*Washington, January 9, 1915.*

The Speaker of the House of Representatives.

Sir: I have the honor to transmit herewith, for the consideration of Congress, copy of a communication of the Secretary of the Interior of the 8th instant, submitting additional matter and specifications in connection with his estimate of appropriation in the sum of $250,000 for the protection of lands and property in the Imperial Valley, California, which was transmitted by this department to the Speaker of the House of Representatives on the 5th instant, referred to the Committee on Appropriations under date of the 7th instant, and ordered to be printed as House Document No. 1476 (Cong. Rec., vol. 52, No. 24, p. 1228).

It is desired by the Secretary of the Interior that this additional matter be made a part of said House Document No. 1476.

Respectfully,

Byron R. Newton,
*Acting Secretary.*

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Department of the Interior,
*Washington, January 8, 1915.*

My Dear Mr. Secretary: Referring to my letter of January 5, 1915, transmitting estimate in the sum of $250,000 for the protection of lands and property in the Imperial Valley, California, against overflows of the Colorado River, with which was inclosed report of Gen. William L. Marshall, consulting engineer to the Secretary of the Interior, relative to the matter:

I transmit herewith letter from Epes Randolph, dated December 8, 1914, together with certain specifications submitted by him relative to the Lower Colorado River diversion and control, and have to request that the same be transmitted to Congress for consideration in connection with the estimate heretofore submitted for this work. This is additional matter for House Document No. 1476.

Cordially, yours,

Franklin K. Lane.

Hon. William G. McAdoo,
*Secretary of the Treasury.*

Inclosure 2056.

TUCSON, *December 8, 1914.*

HON. FRANKLIN K. LANE,
*Secretary of the Interior, Washington, D. C.*

DEAR MR. SECRETARY: Whilst I am not certain as to the scope of the conference which is to be held in your office on the 16th instant, I understand the object that the settlers of the valley have in view is to induce Congress to appropriate $250,000 for the purpose of raising and extending Volcano Lake levee during this winter, and they expect to ask Congress at its next session to appropriate $1,750,000 for the purpose of putting the river in a state of permanent control, their reason for asking for the smaller sum only at this time being that there would not be sufficient time between now and next high-water season to do the work of permanent control. The execution of the work incident to the restoration of the flow of the river to the original channel, including the construction of the levee system necessary to keep it there, will require eight or nine months of economically prosecuted, and five months if prosecuted regardless of cost, and this work must be done during low stages of the river. Therefore, it should be commenced in October of the year in which it is to be done in order that it may be completed prior to June of the same year. Hence, if these people should wait until Congress meets in December, 1915, to ask for the appropriation of the larger sum, they will be in exactly the same fix they are now.

Volcano Lake levee improved at a cost of not to exceed $250,000 can be relied upon for protection for a year only, although it might hold the water back for two years (all depending upon the care taken in construction and maintenance and the volume of the flow of the river and the amount of silt carried). I take it that Congress will not appropriate any money for Colorado River control unless recommended by you, and I assume that you would naturally want to know where you are going to land before setting sail. Therefore I make bold to suggest that if you recommend an appropriation you fix the amount at $2,000,000, $250,000 of which to be immediately available, the balance to stand until used.

The only way in which the river can be permanently controlled at anything like reasonable cost, is set forth in general terms in a paper which I herewith inclose, entitled "Lower Colorado River diversion and control, general specifications and estimates, submitted by Epes Randolph, August 15, 1914." This is a revision of a more elaborate report on the Lower Colorado Delta which I submitted on November 1, 1911, and which was the subject of certain correspondence between Judge Robert S. Lovett and President Taft, and was submitted by the latter to Congress (see H. Doc. No. 504, Feb. 2, 1912), it being necessary to revise my original recommendation to fit changed conditions.

Yours, truly,

EPES RANDOLPH.

## LOWER COLORADO RIVER DIVERSION AND CONTROL: GENERAL SPECIFICATIONS AND ESTIMATES.

[Submitted by Epes Randolph, Aug. 15, 1914.]

The work contemplated herein is as follows, viz:

1. The diversion of the stream from the Bee River Channel, through which it now flows, into Volcano Lake, and its return to the gulf through the channel originally occupied, or by a new channel following the same general course.
2. The development of a levee system which, so long as properly maintained, will control the flow of the river and prevent the inundation of Imperial Valley.

### LEVEE.

The levee, including Bee River Dam, shall be approximately 35 miles in length, commencing at California Development Co.'s concrete headgate and extending southward to engineers' station 1299. Its location is shown on map 54A herewith attached. This location, however, should be regarded as tentative only, as it may be found necessary to vary the same either eastwardly or westwardly. The proposed levee shall be built as follows:

The old California development levee shall be raised, repaired, and riprapped where necessary; such portion of the Ockerson levee as may be found suitable shall be used; the remaining portion shall be new construction throughout. Typical cross sections of the proposed levee are shown on sheet No. 74 herewith attached. Of these several cross sections, the one best suited to the particular location shall be adopted. An effective muck ditch shall underlie the entire levee, and upon the top of the levee a standard gauge railway track shall be placed and the same regarded as a part of the permanent structure. There shall be placed along the levee a telephone system of metallic circuit, with instruments placed in booths spaced approximately 1 mile apart, said booths to be suitable for the housing of all necessary repair tools and supplies.

### APPROXIMATE ESTIMATE OF QUANTITIES AND COST.

Total length of levee, approximately 35 miles.

For convenience, this work is divided into sections 1 and 2.

Section 1 shall begin at the concrete headgate and extend southwardly to "House 8," length approximately 8 miles:

| | |
|---|---|
| Earthwork, 110,000 cubic yards, at $0.25 | $27, 500. 00 |
| Rock, 127,000 cubic yards, at $1 | 127, 000. 00 |
| Pile trestle, 1,700 linear feet, at $15 | 25, 500. 00 |
| Repairs and maintenance of railroad track, 8 miles, at $2,000 | 16, 000. 00 |
| Clearing and grubbing, 8 miles, at $500 | 4, 000. 00 |
| Reconstruction of telephone system, 8 miles, at $100 | 800. 00 |
| Incidentals | 16, 591. 30 |
| Engineering, superintendence, etc., 15 per cent | 32, 608. 70 |
| Total | 250, 000. 00 |

Section 2 shall begin at "House 8" and extend southwardly to levee end or engineers' station 1299, length approximately 27 miles:

| | |
|---|---|
| Earthwork, 1,600,000 cubic yards, at $0.25 | $400, 000. 00 |
| Rock, 600,000 cubic yards, at $1 | 600, 000. 00 |
| Pile trestle, 3,000 linear feet, at $15 | 45, 000. 00 |
| Repairs and maintenance of railroad track, 2½ miles, at $2,000 | 5. 000. 00 |
| Construction of new railroad track, 24.35 miles, at $8,000 | 194, 800. 00 |
| Clearing and grubbing, 26.85 miles, at $1,500 | 40, 275. 00 |
| ncidentals | 19, 272. 83 |
| Engineering, superintendence, etc | 195, 652. 17 |
| Total | 1, 500, 000. 00 |
| Grand total | 1. 750, 000. 00 |

### GENERAL.

When levee shall have been completed it shall be effective as against, first all "overflow" or "back water"; second, all channel diversion where the same is likely to occur during the next high-water period; third, sudden channel diversion in subsequent years.

Inasmuch as the old channel southward from Bee River has been reduced in section throughout and in places entirely closed, and consequently the process by erosion, of reexcavating the same or of creating a new and parallel channel will be slow, it may prove advisable to construct a spillway to temporarily take care of excess water. Should later examination show such spillway to be advisable, the same shall be constructed at some suitable point, probably at Bee River Dam.

After the work above specified shall have been completed the river may be regarded as under control, and such control can be permanently maintained by watchfulness and proper repair work. The cost of patrol and repairs shall not exceed the sum of $30,000 per annum.

The execution of the work herein contemplated must begin not later than October 1, 1914, in order to insure its completion not later than June 1, 1915 at which time the annual high-water period usually begins.

ESPES RANDOLPH.

TUCSON, ARIZ., *August 15, 1914.*

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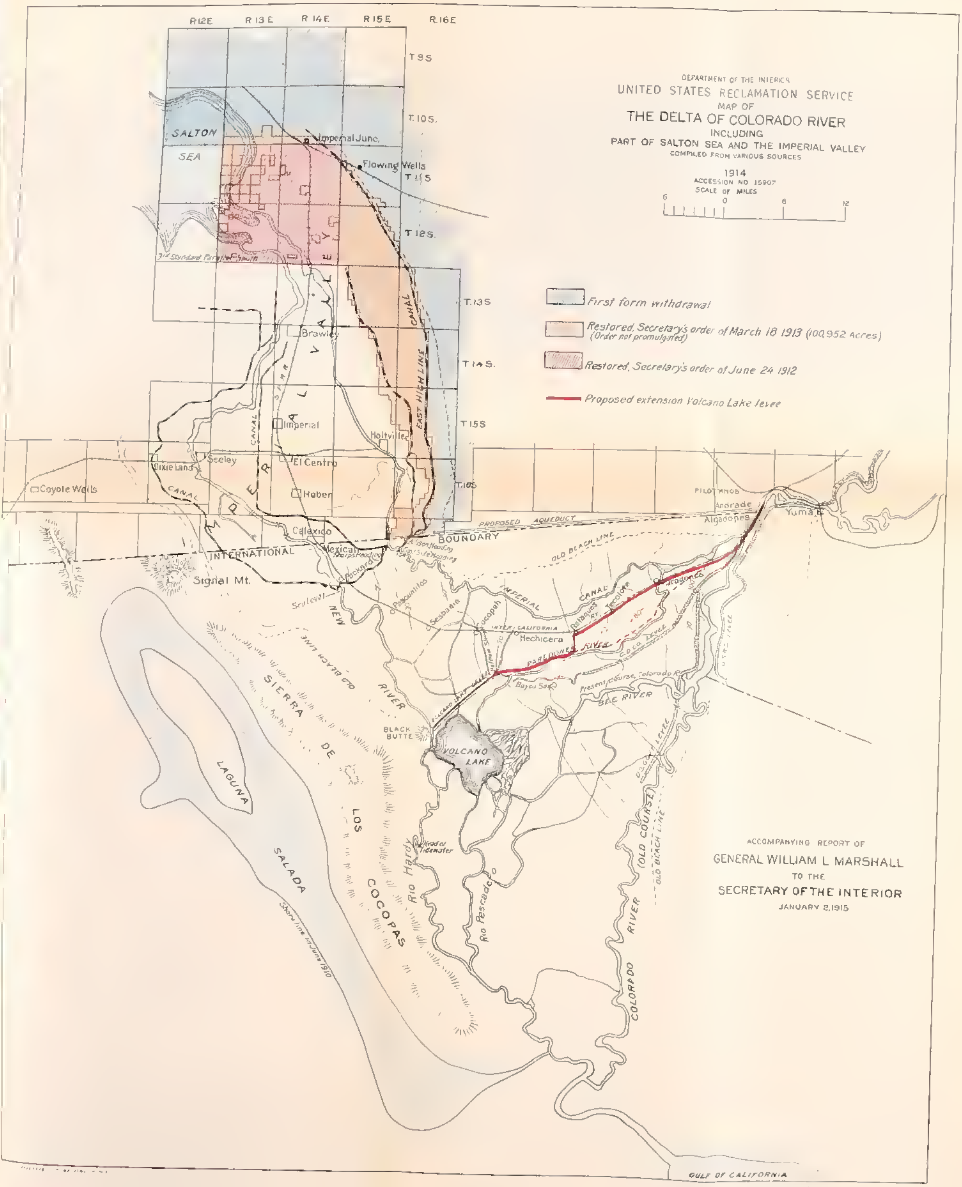

DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE
MAP OF
THE DELTA OF COLORADO RIVER
INCLUDING
PART OF SALTON SEA AND THE IMPERIAL VALLEY
COMPILED FROM VARIOUS SOURCES

1914
ACCESSION NO 15907
SCALE OF MILES

- ▭ *First form withdrawal*
- ▭ *Restored, Secretary's order of March 18 1913 (100,952 Acres)* *(Order not promulgated)*
- ▨ *Restored, Secretary's order of June 24 1912*
- ━ *Proposed extension Volcano Lake levee*

ACCOMPANYING REPORT OF
GENERAL WILLIAM L MARSHALL
TO THE
SECRETARY OF THE INTERIOR
JANUARY 2, 1915

House Doc. No. 1476, 63d Cong., 3d Sess.